While I agree with Dr. Fitzinger that the name of "Japanese," as applied to this Pig, is in all probability a misnomer, I believe he is quite mistaken in supposing that it has anything to do with Abyssinia, for the following reasons :—

1. As far as I have been able to ascertain, the first examples of this beast which reached Europe were those received, in 1860, by the Zoological Society of Antwerp. Mr. Jacques Vekemans, the Director of that establishment, informs me that he purchased a pair and three young of this Pig out of an English vessel, which arrived in the port of Antwerp on the 10th of February of that year. The vessel, as Mr. Vekemans believes, came from Shanghai; but the captain stated that he had bought the Pigs in Japan, which was probably the origin of their being called "Japanese Pigs."

Mr. Jamrach, the well-known dealer in living animals, who has had many of these Pigs through his hands, informs me that he believes China, and not Japan, is their true home, several cases having occurred, to his own knowledge, in which they have been imported in vessels coming direct from the former country.

2. The "*Hassana*" of the Abyssinians, recently described by Dr. Th. von Heuglin in the last-published volume of the Acta Academiæ Leopoldino-Carolinæ *, under the new generic and specific names *Nyctichœrus Hassana*, has evidently nothing to do with the so-called Japanese Pig, but, so far as I can judge from his imperfect description, is probably a species of *Potamochœrus*, a genus which, as I have shown †, differs from *Sus* in the entire absence of the fourth premolar from each jaw.

I think, therefore, we may safely conclude that the true home of the so-called Japanese Pig is China, where, as we know, such monstrous varieties of domestic species are much appreciated. But, for my own part, I cannot see the slightest reason for regarding the "Japanese" Pig as anything more than a domesticated variety. The differences in the skull, noted by Dr. Gray (P. Z. S. 1862, p. 13), are no doubt considerable; but they are not greater than in the case of the Polish Fowl, with its abnormal development of the summit of the cranium, or the Pampas Cow ‡, with its stunted nasals. These cases must, in my opinion, be all referred to the same category of exaggerated variation produced by lengthened domestication.

## *On the Flight of Birds and Insects.* By E. Liais.

In the flight of birds and insects, there are three cases to be taken into consideration :—1, flight without locomotion; 2, flight with locomotion and beating of the wings; 3, flight without beating of the wings, or gliding flight. This third mode presupposes a previous locomotion, produced by beating of the wings. The ascensional force is then obtained at the expense of the active force of the movement of progression, by an effect of the inclination of the wings.

* Vol. xxx. (1864) Beiträge zur Zoologie Afrika's.

† P. Z. S. 1860, p. 301.

‡ Cf. Cat. Ost. Ser. Mus. R. Coll. of Surgeons, ii. p. 624. no. 3832.

According to this inclination, the animal may ascend or move horizontally, as long as its rapidity of motion is not too much diminished by the resistance of the air; to descend requires merely a change of the inclination of the wings; to remain at the same elevation, the animal must again have recourse to the beating of the air.

Flight without locomotion is effected by many birds and insects. In this mode of flight, it appears that, in ascending, the wing partially destroys the ascensional effect which it produced in descending. In birds, as the wing presents its convexity in ascending, and its concavity in descending, it cannot produce the same effect in both directions, even with an equal velocity; but this difference does not exist in those Neuropterous and Dipterous insects which hover in one place. The explanation of this fact is to be found in the different velocity with which the animals raise and depress the wings. In the Frigate-birds, the wing descends at least five times as quickly as it rises. The resistance of the air being in the proportion of the square of the velocity of the wing, the ascending or descending velocity of the animal, caused by a movement of the wing, is in proportion to this resistance multiplied by the duration of action, which is in an inverse ratio to the velocity of the wing. The ascending or descending velocities of a bird, caused by the movements of the wings, are therefore to each other as the velocities of the wings in their ascending and descending movements.

Flight with locomotion and beating of the wings is the most frequent kind, and appears to require less labour; for the movements of the wings are much less rapid. The cause of this is, that the wing experiences no resistance in ascending. When a bird is about to depress its wing, this is a little inclined from before backwards. When the descending movement commences, the wing does not descend parallel to itself in a direction from before backwards; but the movement is accompanied by a rotation of several degrees round the anterior edge, so that the wing descends more in front than behind, and the descending movement is transferred more and more backwards, at the same time that the wing becomes more and more inclined, so as to give a movement at once ascending and accelerative of the horizontal motion of the animal. Towards the close of this movement, a fresh rotation takes place round the anterior margin of the wing, but in the opposite direction, so as to bring the posterior part on a level with the anterior, or even a little below it. This also produces an ascending movement. When the wing has completely descended, it is both further back and lower than at the commencement of the movement, but, as at this commencement, its posterior part is a little lower than its anterior. It is then raised in this position.

To analyze what takes place in this process, we must take a point of the anterior margin, and examine its movements, not in relation to the animal, but to the mass of air in the midst of which it moves. In a horizontal direction, this point is displaced to an extent equal to the sum of its horizontal movement in relation to the centre of gravity of the animal, in consequence of the movement of the wing forwards, plus the movement of the centre of gravity of the bird, which is transported horizontally forward. In the vertical direction, the point in question rises during the elevation of the wing. The resultant of the two movements is a straight or curved trajectory, according to the relation of the movement of the wing forwards and upwards. If the wing rises at first more than it moves forward, and finally moves forward more than it rises, this curved trajectory will present its concavity to the ground. But in all cases, as the horizontal displacement of the centre of gravity of the animal is very great in comparison with the amount to which the wing is elevated, this trajectory is at all points very slightly inclined to the horizon. If the animal keeps the wing inclined to the same extent, the wing, in ascending, will only experience resistance at its edge, seeing that its surface is constantly applied upon the trajectory described by the anterior margin, this trajectory being curved when the wing is curved, as in birds, flat when the wing is flat, as in the Neuroptera.

Moreover, if the animal inclines the wing more than is necessary to apply it upon the trajectory of its anterior margin, an ascending component is produced, during the elevation of the wing, at the expense of the horizontal velocity. In this case the wing during its elevation, far from destroying its descending effect, as is commonly supposed, acts in the same direction as during its descent.

The relation of the weight to the wing-surface increases as the extent of wing. In an Urubu with an extent of wing of 1·37 mètre, the weight supported per square mètre by the whole surface (extended wings and tail and body) was 4·82 kil., or, neglecting the surface of the body and tail, 5·92 kil. In the Humming-Bird the weight supported, referred in the same way to the square mètre of total surface, is only 1·05 kil. In normal flight the velocity of the Urubu, determined by that of its shadow on the ground in calm weather, varies between 10 and 12 mètres per second. Lastly, from the direct measurement of the resistance of the wings in a beat of the same duration, and from the number of beats made in a given time during horizontal flight, it appears that the amount of work produced by birds of the size of the Urubu per second does not equal in amount that necessary to raise one-third of the weight of the animal 1 mètre.

The movement of the wings is an accelerated movement. Experiments have long since shown that the resistance to this kind of movement is greater than that to a uniform movement. This is due to the circumstance that, in the former case, a certain mass of air which accompanies the body has to be set in motion. If the accelerative force be very great, and the movement be annulled before the final velocity has acquired a great value, as is the case in birds, the term of the resistance depending upon the accelerative force is very great in proportion to the term depending only upon the squares of the velocities, which alone is manifested in uniform movements. In the flight of birds, the phenomenon of reaction is therefore of more importance than the other phenomena of resistance. Driving downwards a certain volume of air, the body of the bird rises by recoil, like a rocket. From this it is easy to see that, in the mechanical imitation of flight, it would be advantageous to reduce the size of the beats, and to increase their frequency.—*Comptes Rendus*, Nov. 28, 1864, p. 907.

### *On the* Fumarieæ *with irregular Flowers, and on the Cause of their Irregularity.* By D. A. Godron.

When the flowers of the Fumarieæ are examined in their first stage of development, they are all perfectly regular, but flattened before and behind, as if they were compressed between the axis of the inflorescence and the bract that envelopes them. They retain this regularity in the genera *Dielytra*, *Adlumia*, and *Dactylicapnos*. In these three genera, the external or lateral petals undergo an important modification in the course of their development: the base of each of them is produced into a short, rounded spur, and these two nectariferous appendages are perfectly symmetrical. Why, then, in *Fumaria*, *Corydalis*, &c. (which have originally the same organization) is only a single spur developed, whilst the other spur is aborted, together with its nectary, in such a manner that the flower becomes very irregular, and this irregularity is of a special nature? Moreover the single spur which makes its appearance becomes extraordinarily developed, if we compare it with the two spurs of the Fumarieæ with regular flowers, and especially the spurs of the flowers of *Corydalis*, which will be referred to hereafter.

To what is the abortion of one spur due? To discover the cause of this, I have observed the flowers of Fumarieæ at different stages of development, and especially those of our indigenous species of *Corydalis*, which, from their size, are particularly favourable for observation. I have dug up specimens of *Corydalis solida* and *C. cava* before the stem has issued from the ground in January, and then in February and March. I have ascertained that the flowers are closely pressed against each other, and that even at the first of these periods the single spur is already apparent. If, then, we examine from above the bunch of flowers previously denuded of its bracts, we find that the spurless side of each flower is supported obliquely upon the posterior surface of an older flower. I may add that the two lower flowers are supported upon the base of two stem-leaves, which enter into the regular series of the floral spire. The same facts are observed in *Fumaria*.

From this arrangement, it appears that all the flowers are compressed at the base of one of their sides, which prevents the development of the nectary and of its sheath or spur; on the opposite side, on the contrary, the spur is not hindered in its evolution, and grows without any obstacle. It is to this circumstance, apparently, that we must attribute the abortion of one spur with its nectary, and, consequently, the irregularity of the flowers, in many genera of the family Fumarieæ.

But why is not this irregularity of the flowers produced in *Dielytra* and *Adlumia*, as well as in *Corydalis* and *Fumaria*? The arrange-